

Remarks

Claims 1-7 and 9-24 are pending herein. By this Amendment, claims 1 and 12 have been amended. Claim 8 has been cancelled without prejudice or disclaimer.

Kindly consider the following remarks in response to the Office Action dated February 5, 2007.

Claim 12 has been rejected under 35 U.S.C. §112 second paragraph. Applicants respectfully submit that the formal nature of this request has been overcome by the amendment of claim 12. Consequently the rejection should be withdrawn.

Claims 1-6, 9-14 and 16-24 have been rejected under 35 U.S.C. §103(a) as being unpatentable over Zimmermann et al. (U.S. Patent No. 5,849,176). Claim 7 has been further rejected under 35 U.S.C. § 103(a) as being unpatentable over Zimmermann et al. (U.S. Patent No. 5,849,176) in view of Reed et al. (U.S. Patent No. 5,656,150). The claims are argued individually and comments set forth in the response to the preceding office action are incorporated hereby by reference. The rejections will be treated together because they are commonly deficient.

Applicants gratefully acknowledge the non-finality of the present office action due to the prior rejections being overcome. Further applicants point out in the paragraph bridging pages 5 and 6 of their response dated December 4, 2006 under a rejection by Zimmermann '176, the Reed reference is also being addressed in that paragraph. The statement says that Zimmermann '176 is directed to materials that are added to the feed stock to be cracked rather than materials used in the pre-treatment stage as is the case in instant claim 1. The present office action fails to respond to these comments.

The claims recite a process for reducing the coking on the metal walls of a reactor for the cracking of hydrocarbons etc., and on metal walls of a heat exchanger placed subsequent to the cracking reactor comprising the metal surfaces coming into contact with the organic substance to be cracked are "pre-treated" with a stream of steam comprising (1) a non-sulfur containing silicon compound and (2) a non-silicon containing sulfur compound. The specific non-silicon containing sulfur compound is further specified in the claim. The Zimmermann '176 reference is

inapposite to the teachings of the present invention. Paragraph 7 on page 4 of the office action admits that the teachings of Zimmermann apply to adding compounds "to the feed". The citation relied upon by the examiner is to the summary of the invention and ignores the tenor of the disclosure set forth in Zimmermann '176. The reference is treating the feed stock as exemplified in the first full paragraph in column 3 of the reference. The intent of the reference is directed to treating input materials rather than being directed to treatment of any specific equipment being utilized in the processing of that feed. The requirements of equipment vary relative to materials used in the equipment and the reaction conditions occurring in that equipment.

Page 4 of the present specification discusses the Zimmermann '176 reference. The inventors state that the reference discloses a process in which an additive composed of sulfur and of silicon is added to the feed stock of the cracking unit. The formation of coke is reduced to a greater extent than with a silyl compound alone or sulfur compound alone. This patent claims the use of compounds based on sulphur and on silicon for reducing the coking in the cracking tubes and also in the heat exchangers placed in line subsequent to the cracking reactor. The amounts of silicon thus introduced end up being not insignificant and there is reason to fear blockages either in the cracking tube or in the section for treatment of the cracked gases.

In the last full paragraph of page 5 of the present specification, the inventors state that surprisingly, it has now been found that an additive composed of a mixture of sulphur compound and of silyl compound can be used to pre-treat a hydrocarbon cracking tube in steam and thus to significantly reduce the formation of coke which accompanies the hydrocarbon cracking reaction. This is significant evidence of a clear distinction between the present invention and that of the reference.

The present specification further states that by comparison with process disclosed in Patent Application WO 95/22588, this present novel process is easier to install in steam cracking units since, as carrier gas, it uses steam, a fluid already ordinarily available in the said units.

Zimmermann '176 does not teach "pre-treatment" within the context of the invention but only introduction of a material into feed material. Regardless, speculation in the reference about other compounds is not suggestive of applicants' invention.

The examiner refers to teachings in example 8 in column 6 of Zimmermann '176 wherein it states in place of compounds that simultaneously contain both silicon and sulphur, mixtures of silicon compounds and sulphur compounds also attain the same effect as coke formation inhibitors. This generalized statement does not support a rejection of the present claims. Similarly, the office action in paragraph 7 on page 4 refers to a statement in Zimmermann '176 that the compound containing silicon and/or sulphur is preferably selected from the group that consists of dimethyl sulfide, tetramethyl silane, and their mixtures and however, other volatile compounds can also be used, with reference to column 2, lines 65-67; column 3, lines 1-3.

These generalized statements do not meet the claims which specifically recite individual compounds and which are exemplified in examples 1-6 found pages 10-19 of the present specification. These examples also include comparative examples. This is inapposite to examples 6-10 in Zimmermann '176 with example 10 describing comparative examples as well as those according to the Zimmermann invention. A single compound is utilized containing silyl and sulfur. A generic disclosure, such as that relied upon by the examiner in the office action set forth above in the Zimmermann '176 reference, does not form the basis to support an obviousness rejection where one skilled in the art would have to choose judiciously from a genus of possible combinations. In re Sivaramakrishnan, 213 USPQ 441 (CCPA 1982). Similarly, a party alleging anticipation based on a range disclosed in a prior art patent must show that the patent describes to one skilled in the art a combination meeting the limitations of the claims of the patent in suit from the many possible candidates. Ultradent Products, Inc. v. Life – Like Cosmetics, Inc., 44USPQ 2nd 1336 (CAFC 1997).

The “non-preferred” as well as the “preferred” portion of a reference is pertinent for what it teaches to one skilled in the art. In re Meinhardt, 157 USPQ 270 (CCPA 1968). It is not within the framework of 35 U.S.C. 103 to pick and choose from the relevant prior art only as much will support a holding of obviousness, to the exclusion of other parts necessary to full appreciation of what the prior art suggests to one skilled in the art. In re Wesslau, 147 USPQ 391 (CCPA 1965). The issue of patentability must be approached in terms of what would have been obvious to one skilled in the art at the time the invention was made in view of the sum of all

the relevant teachings in the art. In re Kuderna et al., 165 USPQ 575 (CCPA 1970). After the involved facts are determined, the decision maker must then make the legal determination of whether the claimed invention as a whole would have been obvious at the time that invention was unknown and just before it was made to a person have ordinary skill in the art. Panduit Corporation v. Dennison Manufacturing Company, 1 USPQ 2nd 1593 (CAFC 1987).

The present claims specifically recite pre-treatment utilizing multiple distinct compounds in that treatment and specifying the non-silicon containing sulfur compound. Such claims are not met by teachings directed to addition of a compound containing a combination of components to a feed perhaps especially rich in sulfur exemplified by several examples containing a single compound with the multiple components. Teachings drawn to speculative unexemplified silicon and sulfur compounds do not support a rejection under 35 U.S.C. §103 because they encompass a plethora of compounds for which a person of ordinary skill in the art is not taught how to make and use such generically disclosed compounds in the pre-treatment environment of the present invention.

As pointed out in the response to the previous office action, Reed does not teach or suggest the use of steam with a sulfur compound within the scope of the present claims. Applicants refer the examiner to the last paragraph of page 4 of their response dated December 4, 2006 through line 13 of page 5 of that paper. Reed does not teach or suggest the use of steam with a particular sulfide compound as recited in claim 1.

Applicants have discussed on page 4 of their specification the Reed reference. According to the specification, this reference relates to a method for reducing the formation of coke in a hydrocarbon cracking tube. This method employs a silicon compound as a mixture with a tin compound. Some improvements have been made to it, such as the use of a reducing gas as carrier fluid for pre-treating the cracking tube (Patent US 5,616,236) or the cracking of a desulphurized feedstock (Patent EP 70, 665). This type of treatment remains expensive and the long-term effects of the tin on the metallurgy of the cracking tube and in the downstream sections are not known. All this is set forth in the specification. Applicants refer the examiner to column 8, containing claim 1 of the Reed reference which recites introducing an antifoulant

comprising tin and silicon into said crossover conduit means but the present invention clearly excludes the use of tin for the reasons set forth on page 4 of the present specification.

Furthermore, the examples of the present specification clearly set forth unexpected advantages relative to utilization of the method according the present invention. Comparative exemplification is set forth in the examples which show in Example 1, a 66% reduction in coke, and Example 2, a 27% reduction in coke, and in Example 3, an 18% reduction in coke, in Example 4, a 17% reduction in coke and in Comparative Example 5 relative to preceding Example 2 but without the addition of hexamethyldisiloxane, a 5% increase in coke. Example 6 shows substantial and unexpected inhibition of coke formation in Table 2, which is reproduced below:

Table 2
Rates of coking of lengths of metal
placed in the heat exchanger

	Rates of coking ($\mu\text{g} \times \text{cm}^{-2} \times \text{min}^{-1}$)		Inhibition of the coke (%)
	Untreated length of metal	Length of metal treated with S and Si	
Cycle 1	42	17	59
Cycle 2	54	23	57
Cycle 3	66	31	53
Cycle 4	84	38	55
Cycle 5	90	52	42
Cycle 6	100	64	36

None of this is taught in the applied prior art. The combination of reference would at the minimum include tin, which is excluded by the present invention.

The claims have been amended to exclude a mixture with a tin compound as pointed out on page 4 of its earlier response in the second full paragraph on that page and is supported by the second full paragraph on page 4 of the present specification and by the tenor of the disclosure which does not mention the utilization of tin in any of the exemplification and description of the invention.

Consequently, the rejection based on the combination of Zimmerman ' 176 and Reed has been overcome and should be withdrawn for the reasons advanced above.

For all the reasons advanced above, Applicants respectfully submit that the application is in condition for allowance and that an action is earnestly solicited respectfully submitted.

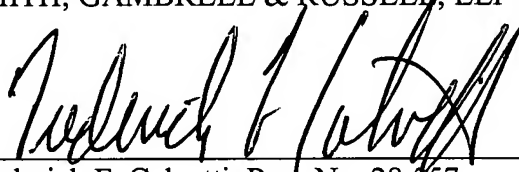
If any fees are due in connection with the filing of this Amendment, such as fees under 37 C.F.R. §§ 1.16 or 1.17, please charge the fees to our Deposit Account No. 02-4300; Order No. 033808.172.

The courtesy of an Examiner interview is respectfully requested.

Respectfully submitted,

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